TABLE I. Characteristics of the subject in relation to the exposure to occupational sensitizers (cyanoacrylate and methacrylate)

	Normal values	At work (3 mo)	Off work (3 wk)	Control inhalation test 7 hr after	Glue inhalation test 30 min exposure	
					7 hr after	24 hr after
Chest symptoms		+++	+	+	++	+
Nose symptoms		+++	0	0	0	0
Treatment		200 μg/day (A) 200 μg/day (B)	200 μg/day (B)	0	0	0
FEV_1 (L [% pred])	2.2	2.3 (100)	2.5 (108)	2.4 (105)	2.4 (103)	2.6 (114)
VC (L [% pred])	2.7	3.0 (111)	3.0 (111)	3.3 (120)	ND	3.3 (120)
PC_{20} (mg/ml)	>16	24	>64	>64	ND	>64
Induced sputum						
TCC (10^6/ml)	<4.5	1.0	1.3	2.7	3	1.4
Neutrophils (%)	<35	16.2	26.7	28.7	65.5	54.2
Eosinophils (%)	<2	13	0	0	5.8	5
Metachromatic cells (%)	<0.07	0.13	0.06	0	1.5	0.26
Blood eosinophils (10^9/L)	<0.4	0.5	0.1	0.2	ND	0.4

A, Albuterol; *B*, budesonide (nasal spray); +++, severe; ++, moderate; +, mild; *TCC*, total cell count; *ND*, not done; PC_{20}, provocation concentration of methacholine to cause a fall in FEV_1 of 20%.

REFERENCES

1. Pizzichini E, Pizzichini MMM, Efthimiadis A, Evans S, Morris MM, Squillace D, et al. Indices of airway inflammation in induced sputum: reproducibility and validity of cell and fluid-phase measurements. Am J Respir Crit Care Med 1996;154:308-17.
2. Gibson PG, Hargreave FE, Girgis-Gabardo A, Morris M, Denburg JA, Dolovich J. Chronic cough with eosinophilic bronchitis: examination for variable airflow obstruction and response to corticosteroid. Clin Exp Allergy 1995;25:127-32.
3. Juniper EF, Cockcroft DW, Hargreave FE. Histamine and methacholine inhalation tests: a laboratory tidal breathing protocol. Lund: Sweden AB Draco; 1994.
4. Lozewicz S, Davidson AG, Hopkirk A, Burge PS, Boldy DAR, Riordan JF, et al. Occupational asthma due to methyl methacrylate and cyanoacrylates. Thorax 1985;40:836-9.
5. Fabbri LM, Boschetto P, Zocca E, Milani G, Pivirotto F, Plebani M, et al. Bronchoalveolar neutrophilia during late asthmatic reactions induced by toluene diisocyanate. Am Rev Respir Dis 1987;136:36-42.

Acute cardiac and pulmonary arrest after infusion of vancomycin with subsequent desensitization

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A 43-year-old woman who had undergone a posterior lumbar fusion with bone grafting and instrumentation 1 week previously was readmitted with a draining-wound hematoma. She subsequently underwent irrigation and debridement after general anesthesia was achieved without complication. After the operation she was doing well with systolic blood pressure readings ranging from 112 to 166 mm Hg. Her postoperative hematocrit level was 31, and serum electrolytes, blood urea, and creatinine values were in the normal range. On postoperative day 2, the patient started receiving vancomycin after intraoperative wound cultures tested positive for methicillin-resistant *Staphylococcus*. One gram of vancomycin in 250 ml of

Abbreviation used
D_5W: 5% dextrose in water

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TABLE I. Desensitization protocol for vancomycin

Dose no.	Dose* (mg)
1	0.005
2	0.010
3	0.020
4	0.040
5	0.080
6	0.160
7	0.320
8	0.640
9	1.25
10	2.50
11	5.00
12	10.00
13	20.00
14	40.00
15	80.00
16	160.00
17	320.00
18	640.00
19	1000.00

*Each dose was given in 50 ml of D_5W infused over 15 minutes by infusion pump except the last dose, which was administered as 25 ml of 1 gm in 250 ml D_5W over 15 minutes. The rest of the solution (1 gm in 250 ml D_5W) was then infused at a rate of 200 ml/hr.

5% dextrose solution was infused at a rate of 250 ml/hour for 1 hour. The patient had no adverse reaction, and the following 12 hours of her postoperative course were unremarkable.

The same dose and rate of vancomycin was then administered for a second time on postoperative day 3. Approximately 2 minutes into the infusion, the patient had acute shortness of breath associated with swelling of the face, lips, and eyelids. She began gasping for air with severe respiratory stridor and subsequently underwent complete respiratory arrest within 3 minutes of the infusion being started. Vancomycin was immediately discontinued, and manual ventilation was attempted by using a bag and face mask with 100% oxygen. This was unsuccessful because of severe upper-airway constriction and presumed bronchospasm. The patient then had severe hypotensive shock and complete cardiovascular collapse, at which point there was no identifiable pulse. Cyanosis developed, and cardiac compressions were begun as she was administered 1 ampule of 1:10,000 epinephrine intravenously along with 2 mg of Narcan.

Large volumes of crystalloid were administered, and there was a significant decrease in resistance to manual ventilation during the next 90 seconds. Cardiac compressions were stopped when the patient's pulse returned with an initial barely identifiable systolic blood pressure of 40 mm Hg. Although experiencing tachycardia (a heart rate of approximately 150 beats/minute) she was administered a second ampule of 1:10,000 intravenous epinephrine. Because of persistent moderate-to-severe upper-airway obstruction, she required endotracheal intubation and continued manual ventilation. Over the next 10 minutes, her blood pressure rose to 130/70 mm Hg and remained stable thereafter.

Because no other acceptable antibiotic therapy was available, desensitization to vancomycin was performed as outlined in Table I. Throughout the desensitization protocol, the patient had mild itching that responded promptly to intravenous diphenhydramine. Near the end of the desensitization procedure, she had mild hypotension and oxygen desaturation as measured by pulse oximetry after receiving slightly less than the full 250 ml of vancomycin solution (1 gm/250 ml D_5W). These symptoms rapidly reversed with 0.3 ml of 1:1,000 epinephrine administered subcutaneously along with 25 mg of intravenous diphenhydramine). Thereafter, the vancomycin was administered at 1 gm/500 ml D_5W over 2 hours without adverse reaction. She tolerated subsequent doses without difficulty and was discharged with a regimen of 5 weeks of further intravenous vancomycin therapy, which was uneventful.

Vancomycin is being increasingly used because of the growing prevalence of penicillin-resistant organisms.[1, 2] The potentially life-threatening complications associated with the use of vancomycin must be observed, recognized, and treated promptly. This appears to be especially important in patients receiving anesthesia or large doses of narcotics and may be related to the fact that both vancomycin and narcotics induce a dose- or rate-dependent mast-cell degranulation.[3, 4, 5]

In patients who have had anaphylactoid reactions to vancomycin, rapid desensitization may be considered when no other suitable antibiotic therapy is available.

REFERENCES

1. Myers JP, Dinnemann CC Jr. Bacteremia due to methicillin-resistant *Staphylococcus aureus*. J Infect Dis 1982;145:532-6.
2. Watana Kunakoln C. Treatment of infections due to methicillin-resistant Staphylococcus aureus. Ann Intern Med 1982;97:376-8.
3. Polk RE, Healy DP, Schwartz LB, et al. Vancomycin and the red-man syndrome: pharmacodynamics of histamine release. J Infect Dis 1988;157:502-7.
4. Rosow CE, Mos J, Philbin DM, Savarese JJ. Histamine release during morphine and fentanyl anesthesia. Anesthesiology 1982;56:93-6.
5. Wong JT, Ripple RE, MacLean JA, Marks DR, Bloch KJ. Vancomycin hypersensitivity: synergism with narcotics and "desensitization" by a rapid continuous intravenous protocol. J Allergy Clin Immunol 1994;94:189-94.